

## APPENDIX I

# GLOSSARY

### A

**AFWA**—Air Force Weather Agency.

**ALBEDO**—The percent of radiation returning from a surface compared to that which strikes it. An arbitrary value of whiteness possessed by a digital image or an individual pixel.

**ALGORITHM**—A step-by-step procedure for solving a mathematical problem.

**ANALOG**—Proportional and continuous. Analog data is collected or presented in continuous form, such as voltage measurements or temperature changes.

**ANOMALOUS PROPAGATION (AP)**—The abnormal bending of a radar beam as it passes through the atmosphere.

**ANOMALY**—Deviation or departure from the normal. Irregular.

**APOGEE**—The highest point (greatest distance from the surface) of a satellite orbit.

**APT**—Automatic Picture Transmission. The automatic transmission of images by polar-orbiting satellites.

**ASCENDING NODE**—The period of time when a polar-orbiting satellite is traveling from south toward the north.

**ASSOCIATED PRINCIPAL USER**—A principal user linked to a WSR-88D system with a dedicated telecommunication line.

**ATTENUATION**—Any process in which the power of a beam of energy is dissipated.

**AUTODIN**—Automatic Digital Network.

**AVHRR**—Advanced Very High Resolution Radiometer.

**AWN**—Automated Weather Network-the complex worldwide collection and distribution network of meteorological data operated by the Air Force.

**AZIMUTH**—The horizontal angular measurement from a fixed reference to a point. The Navy uses angular measurements in clockwise degrees from 0 to 360. When 0 is referenced to true north, the result is a true azimuth bearing. When referenced to an arbitrary direction, such as the bow of a ship, the result is a relative azimuth bearing.

### B

**BACKING**—A change in wind direction in a counterclockwise manner in the Northern Hemisphere, or a clockwise direction in the Southern Hemisphere.

**BACKSCATTER**—That portion of energy scattered back from a target to a radar antenna.

**BASE DATA**—Digital fields of reflectivity, mean radial velocity, and spectrum width data provided at the finest resolution available from the WSR-88D Doppler radar.

**BEAM WIDTH**—The angular width of the antenna pattern. Usually the width where the power density is one-half that on the axis of the beam. (half-power point).

**BOUNDED WEAK ECHO REGION (BWER)**—A core of weak equivalent reflectivity in a thunderstorm that identifies the location of a strong updraft.

**BRIGHT BAND**—The enhanced layer of a radar echo caused by the difference in radar reflectivity of ice and water particles. This echo is interpreted as the delineation on a radar display between frozen and liquid precipitation.

### C

**CENTROID**—The center of mass of a storm.

**CNMOC**—Commander, Naval Meteorology and Oceanography Command. Headquartered at Stennis Space Center, Mississippi.

**CONUS**—Conterminous/continental United States. Those states of the United States enclosed

within one common boundary, that is, the lower 48 states of the United States.

**CONVECTION**—Motions in a fluid, such as the atmosphere or water, which are predominantly vertical, resulting in a vertical transport of mass.

**CONVECTIVE CELL**—Cumuliform cloud, usually with vertical updrafts in the center and sinking downdrafts in the outer region.

**CONVERGENCE**—Atmospheric flow approaching the same point from different directions.

**CORRELATION**—A measure of similarity between variables or functions.

**CROSS-SECTION PRODUCT**—A vertical depiction of the atmosphere produced by compiling base data vertically, along a user defined direction.

## D

**DDN**—Defense Data Network.

**DECIBEL (dB)**—A logarithmic expression for the ratio of two quantities. Mathematically,  $\text{dB} = 10 \text{ Log } (P_1/P_2)$ .

**DEDICATED COMMUNICATIONS**—Communications links that have no other purpose than to transmit data between components of the WSR-88D.

**DERIVED DATA**—Data created from the computer processing of base data.

**DESCENDING NODE**—The period of time when a polar-orbiting satellite is traveling from north toward the south.

**DIFFRACTION**—The process that causes electromagnetic waves traveling in a straight path to bend around a boundary or obstruction.

**DISTORTION**—An apparent warping and twisting of an image received from a satellite caused by the characteristics of the satellite lens and the optical alignment.

**DIVERGENCE**—Atmospheric flow leaving the same point in different directions.

**DMS**—Position given in degrees, minutes, and seconds of latitude and longitude.

**DMSP**—Defense Meteorological Satellite Program.

**DOPPLER EFFECT**—The observed change in the frequency of sound or electromagnetic waves due

to the relative motion of the source and the observer.

**DOWNBURST**—A strong downdraft from a thunderstorm cell that induces an outburst of damaging winds on or near the ground.

**DRYLINE**—A mesoscale feature with its own associated vertical circulation. It is a narrow, almost vertical zone, across which a sharp moisture gradient, but little temperature gradient, occurs at the earth's surface.

**DSN**—Defense switched network, an upgrade and name change from the automatic voice network (AUTOVON).

## E

**EARTH SYNCHRONOUS**—*See geostationary.*

**ECCENTRICITY**—The ratio of apogee and perigee. A true circular orbit has an eccentricity of 1.

**ECHO**—Energy backscattered from a target as seen on the radar display.

**ELECTROMAGNETIC ENERGY**—Energy propagated through space in the form of an advancing disturbance in electric and magnetic fields. Also referred to as radiation.

**ELECTROMAGNETIC SPECTRUM**—The total range of the various radiation frequencies and corresponding wavelengths.

**ENHANCEMENT**—The process of augmenting a black and white satellite image by the addition of either color or alternating gray shading.

**EPHEMERIS DATA**—Temporary data listing the coordinates of a satellite at a number of specific times within a specific period.

**EPOCH**—An instant in time, selected as a point of reference.

**EQUATORIAL ORBIT**—Satellites that circle the earth over the equator and have an inclination of 0°. (Geostationary satellites).

**EXTERNAL USER**—Anyone other than a Principal User who has access to WSR-88D products, for example, information service companies, broadcast meteorologists, aviation interests, and universities.

## F

**FAA**—Federal Aviation Administration.

**FNMOCC**—Fleet Numerical Meteorology and Oceanography Center. Located in Monterey, California.

**FULL DISK**—A satellite image covering an entire hemisphere produced from a series of smaller area images.

## G

**GEOSTATIONARY**—A satellite in an equatorial orbit moving in the same direction as the earth. The speed and altitude of the satellite is such that it is always located in a stable orbit over the same position on the equator.

**GEOSYNCHRONOUS**—*See geostationary.*

**GHz**—Gigahertz. Equal to one billion hertz ( $10^9$ ).

**GOES**—Geostationary Operational Environmental Satellite.

**GROUND CLUTTER**—The pattern of radar echoes from fixed ground targets.

**GROUND WAVE**—That portion of a transmitted electromagnetic wave that travels in the atmosphere immediately above the surface of the earth.

**GVAR**—GOES Variable data format.

## H

**HECTOPASCAL (hPa)**—A unit of 100 pascals used to measure pressure, exactly equivalent to 1 millibar.

**HERTZ**—A frequency defined as one cycle per second.

**HF**—High frequency. (1-3 MHz to 30 MHz.)

**HOOK ECHO**—A pendant or hook on the right rear of an echo that often identifies mesocyclones and tornadic activity on the radar display.

**HRPT**—High Resolution Picture Transmission, automatically transmitted from polar-orbiting satellites.

## I

**INCLINATION**—The angle of the orbital plane of a satellite relative to the earth's equatorial plane.

**INFRARED (IR)**—The portion of the electromagnetic spectrum with wavelengths just slightly longer than visible light (thermal energy).

**INVERSION**—With respect to temperature, an increase in temperature with height. Normally, temperature decreases with height in the atmosphere.

## K

**kHz**—Kilohertz. Equal to one thousand hertz ( $10^3$ ).

**kn**—Alternate abbreviation for knot. In meteorology, the more frequently used abbreviation is "kt," but this should not be confused with the uppercase "KT" meaning kiloton.

## L

**LINE ECHO WAVE PATTERN (LEWP)**—A radar echo pattern formed when a segment of a line of thunderstorms surges forward at an accelerated rate.

**LINE-OF-SIGHT**—An imaginary straight line between a radar and the target position.

**LLWS**—Low-level wind shear.

**LMT**—Local Mean Time.

## M

**MACROBURST**—A large downburst with 4 km (2 nmi) or larger outflow size with damaging wind lasting 5 to 20 minutes.

**MESOCYCLONE**—A region in a supercell thunderstorm that rotates (usually cyclonically) and is correlated with severe weather.

**METEOROLOGY**—The study of phenomenon of the atmosphere.

**METVANS**—USMC mobile meteorological vans. Highly transportable, completely equipped meteorological facilities constructed as complete modules in cargo containers.

**MF**—Medium frequency. (300 kHz to 3 MHz.)

**MHz**—Megahertz. Equal to one million hertz ( $10^6$ ).

**MICROBURST**—A small downburst, 1 to 5 km (0.5 to 2.5 nmi) in outflow size, with peak winds lasting 2 to 15 minutes.

**MICROMETER**—A unit of length equal to one millionth ( $10^{-6}$ ) of a meter. Also called a micron.

**MINIMUM DETECTABLE SIGNAL**—A received signal whose power is just above the noise level of the receiver.

**MSL**—Mean sea level. a suffix used after altitude measurements.

## N

**NADIR**—The position directly under a satellite on the earth's surface at a specific point in time. Also, subpoint.

**NESDIS**—National Environmental Satellite, Data, and Information Service, a division of NOAA.

**NEXRAD**—Acronym for NEXt generation RADar (WSR-88D Doppler radar).

**NIPRNET**—Unclassified Internet Protocol Routing Network.

**NOAA**—National Oceanic and Atmospheric Administration. NOAA is an agency of the U.S. Department of Commerce.

**NODAL INCREMENT**—The longitude, in degrees, between successive northbound equatorial crossings of a polar-orbiting satellite.

**NODAL PERIOD**—The period, in minutes, between successive northbound equatorial crossings of a polar-orbiting satellite.

**NODDS**—Navy Oceanographic Data Distribution System.

**NOISE**—Any unwanted, usually random, fluctuation of a signal.

**NON-ASSOCIATED PRINCIPAL USER**—A principal user with access to a WSR-88D system through means of dial-in telecommunications.

**NWRN**—National Weather Radar Network.

**NWS**—National Weather Service, a division of NOAA.

**NYQUIST VELOCITY**—The maximum unambiguous velocity that can be measured by a Doppler radar.

## O

**OKTAS**—Eighths of the sky.

**ORBIT**—The path that a satellite follows in its motion through space, relative to the earth.

**OUTFLOW BOUNDARY**—The leading edge of horizontal airflow resulting from cooler, denser air sinking and spreading out at the surface. Often caused by the downdraft of thunderstorms.

## P

**PERIGEE**—The lowest point (shortest distance from the surface) in a satellite orbit.

**PERIOD**—A general term for the time required for one orbit around the earth.

**PHASE**—A particular angular stage or point of advancement in a cycle; the fractional part of the angular period, through which the wave has advanced, measured from the phase reference.

**PIXEL**—The individual component of an image scan line defined by a single video sample in a digital image system. The greater the number of pixels in a line, the greater the display's resolution.

**POES**—Polar Orbiting Environmental Satellite.

**POLAR ORBITING**—Satellites with high orbital angles, crossing over the polar regions of the earth.

**PRINCIPAL USER**—Principal users of the WSR-88D are the National Weather Service (NWS), the Air Force Weather Agency (AFWA), the Naval Meteorology and Oceanography Command, Marine Corps Weather Service Units, and the Federal Aviation Administration.

**PROPAGATION**—Transmission of electromagnetic energy as waves through or along a medium.

**PULSE**—A single short duration transmission of electromagnetic energy.

**PULSE DURATION**—Time occupied by a burst of transmitted radio energy. This may also be expressed in units of range (pulse length).

**PULSE REPETITION FREQUENCY (PRF)**—The number of radar pulses transmitted per second.

**PULSE REPETITION TIME (PRT)**—The time interval from the beginning of one pulse to the beginning of the next succeeding pulse.

**PULSED RADAR**—A type of radar designed to facilitate range measurement in which transmitted energy is emitted in periodic, brief transmissions.

## R

**RADAR SIGNATURE**—Visible patterns of radar return echoes that are commonly associated with certain phenomena, usually correlated with severe weather events.

**RADIAL VELOCITY**—The component of velocity toward or away from a radar that is parallel to the radar beam.

**RADIOMETER**—The scanning sensor aboard satellites sensitive to only a small range of electromagnetic wavelengths; that is, water vapor, infrared, visible light, and microwave.

**REFLECTIVITY (Z)**—A measure of the efficiency of a radar target in intercepting and returning radar energy.

**REFRACTION**—Changes in the direction of energy propagation (due to changes in speed) as a result of density changes within the propagating medium.

**REFRACTIVE INDEX**—A measure of the amount of refraction. Numerically equal to the ratio of wave velocity in a vacuum to wave velocity in the medium (the atmosphere).

**RESOLUTION**—In radar, the minimum separation in angle or in range between two targets that the equipment is capable of distinguishing. With satellite imagery, resolution is a measure of the smallest detail visible in the display. It is usually measured by the number of pixels that can be fit horizontally and vertically on the display.

**RH**—Usual abbreviation for relative humidity.

## S

**SAR**—Acronym for Search and Rescue.

**SCAN**—One complete rotation of a radar antenna at a single elevation angle.

**SCATTERER**—Any object capable of reflecting the radar signal.

**SECOND-TRIP ECHO**—A radar echo received from a target beyond the normal maximum range of detection. Also called range folding.

**SHADOW ZONE**—A zone in which the intensity of electromagnetic energy is negligible due to diffraction or refraction.

**SHEAR**—Speed or directional variation in a wind field.

**SHF**—Super-high frequency. (3 GHz to 30 GHz).

**SIDE LOBES**—Concentrated elements of focused power outside the main radar beam caused mainly by diffraction near the antenna. Ground clutter is one common result from side lobes.

**SIGNAL-TO-NOISE RATIO**—A ratio of the intensity of the minimum signal capable of being detected to the amount of interference generated by the radar.

**SIPRNET**—Secure Internet Protocol Routing Network.

**SKY WAVE**—That portion of a transmitted electromagnetic wave that travels upward and outward and is not in contact with the ground. Part of a sky wave is refracted by the ionosphere and returns to earth.

**SPACE WAVE**—At frequencies of greater than 30 MHz, the ionosphere has no effect on electromagnetic waves, thus allowing the waves to travel in straight lines eventually reaching space. The space wave is limited to line-of-sight transmission.

**SQUALL LINE**—Any line or narrow band of active thunderstorms.

**SUBPOINT**—The point on the earth's surface immediately below a satellite at a specific point in time. Also, nadir.

**SUN SYNCHRONOUS**—An orbit in which the satellite passes overhead at essentially the same solar time throughout the year.

**SUPERCCELL**—A large, long-lived thunderstorm cell consisting of one steady updraft/downdraft system that is capable of producing the most severe weather (tornadoes, high winds, and large hail).

**SYNCHRONIZATION**—The process of matching the line scanning rate in the display equipment with that of the image transmitting system.

**SYNOPTIC**—In general, pertaining to or affording an overall view. In meteorology, this term has become specialized in referring to the use of meteorological data obtained simultaneously over a wide area for presenting a comprehensive picture of the state of the atmosphere.

## T

**TAC-4**—Tactical advanced computer, version four.

**THIN LINE ECHO**—A narrow, elongated non-precipitating echo usually associated with thunderstorm outflow, fronts, or other density discontinuities. Also called a fine line.

**THRESHOLD VALUE**—An adaptable parameter which serves as a minimum or maximum value that phenomena must or must not exceed to be accepted by an algorithm or displayed on a product.

**TIROS**—Television InfraRed Operational Satellite.

## U

**UHF**—Ultra high frequency. (300 MHz to 3 GHz.)

## V

**VAS**—Vertical Atmospheric Sounder.

**VEERING**—A change in the wind direction in a clockwise manner in the Northern Hemisphere, or a counterclockwise manner in the Southern Hemisphere.

**VELOCITY ALIASING**—Ambiguous detection and display of radial velocities.

**VHF**—Very high frequency. (30 MHz to 300 MHz.)

**VOLUME COVERAGE PATTERN**—A volumetric sampling procedure. A combination of elevation slices designed to provide radar

coverage over a specific volume of the atmosphere.

**VOLUME SCAN**—The completion of a sequence of 360° scans at prescribed elevation angles to obtain a three-dimensional view around the radar site.

**VOLUMETRIC PRODUCT**—Any product the WSR-88D produces which requires **data** from the entire volume coverage pattern before processing can be completed.

**VORTEX**—In its most general use, any flow possessing vorticity. More often the term refers to converging flow producing rotation. A tornado is a vortex.

## W

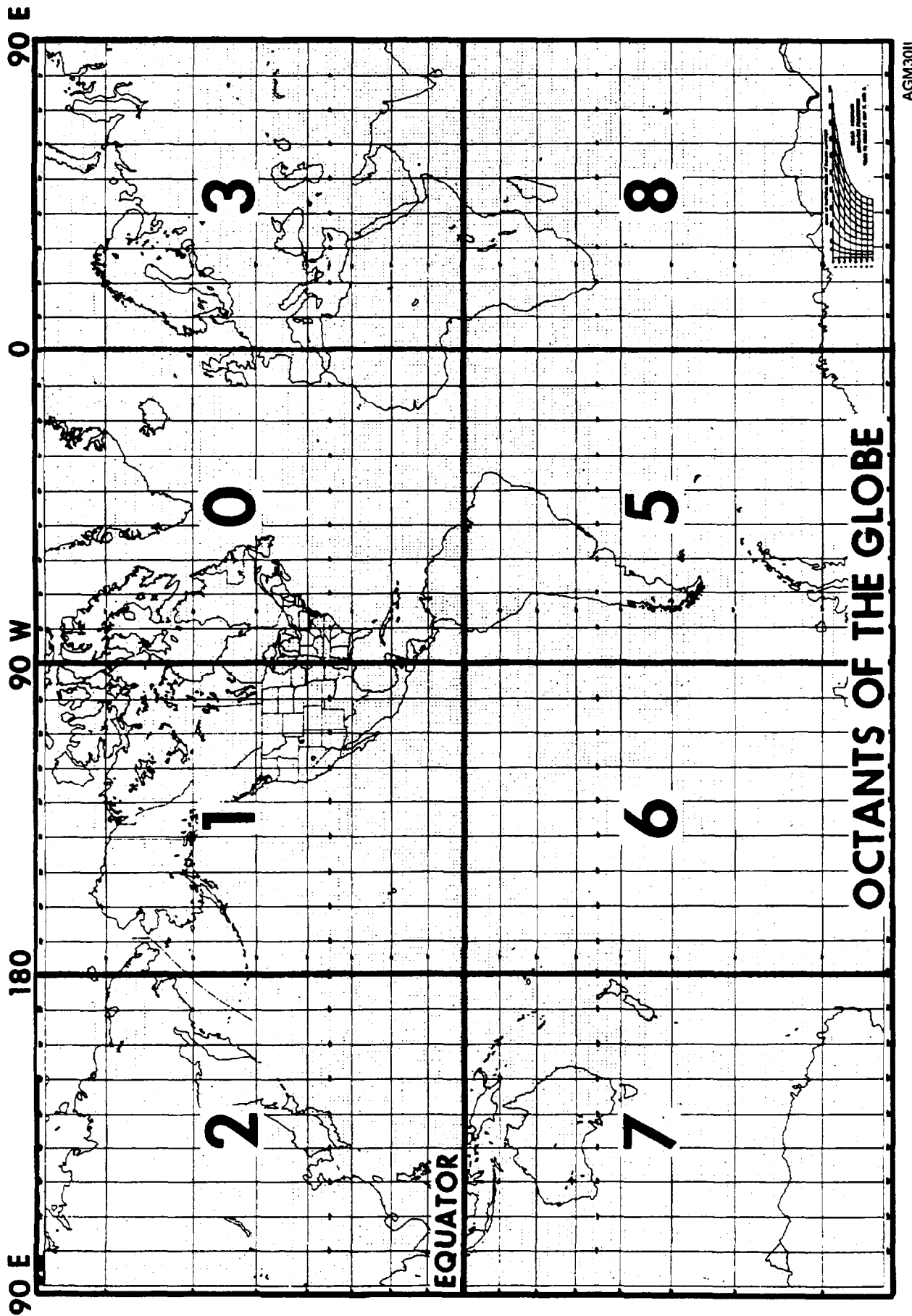
**WATER VAPOR IMAGE**—A satellite image derived from the thermal energy emitted by water vapor, usually at the 6.7 micrometer wavelength.

**WEAK ECHO REGION (WER)**—Within a convective echo, a localized minimum of equivalent reflectivity associated with a strong updraft region.

**WEFAX**—An acronym for weather facsimile, specifically the NWS service providing satellite imagery and graphic products via a geostationary satellite data broadcast.

**APPENDIX II**

**OCTANTS OF THE GLOBE**

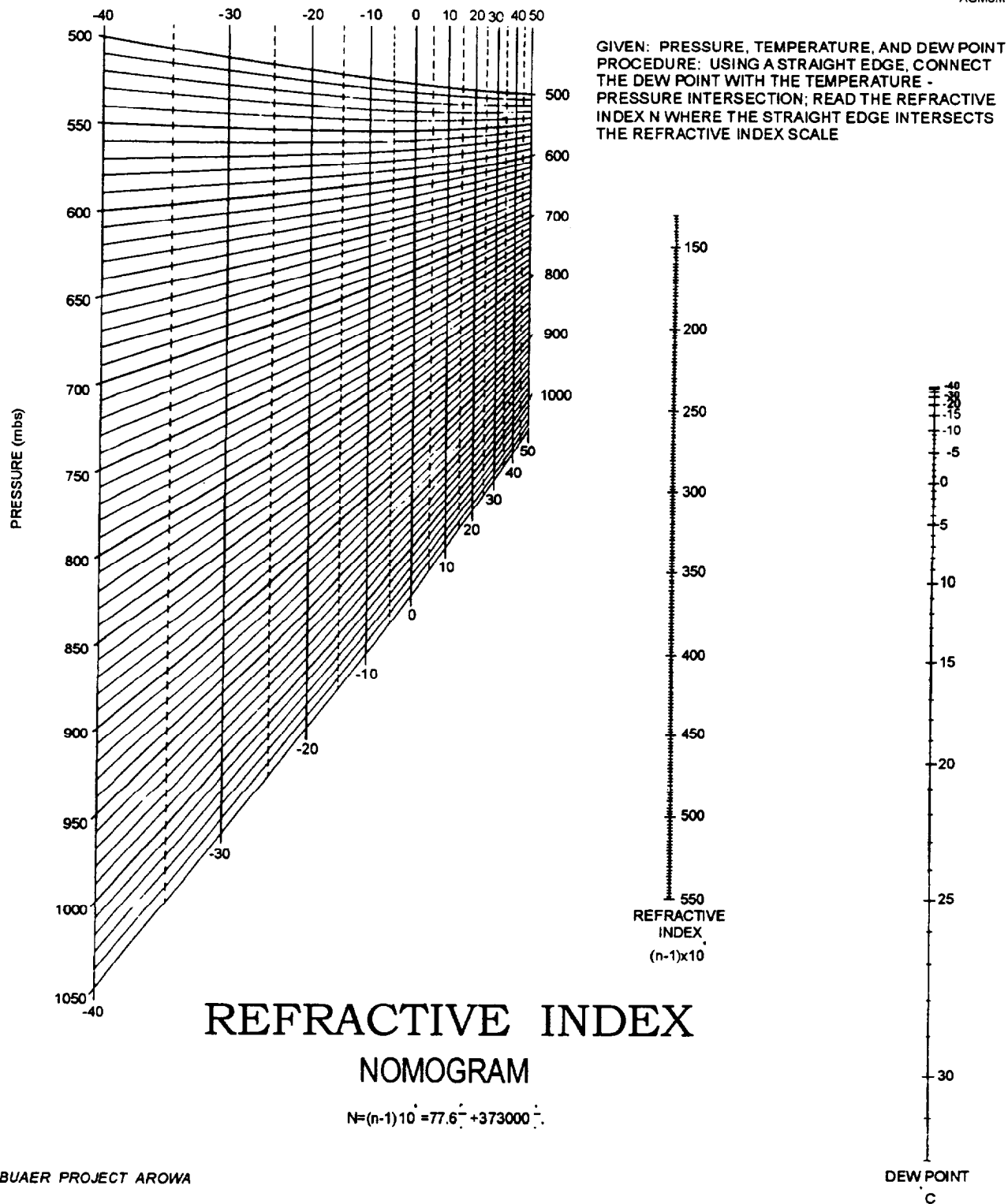


AII-1.—Octants of the Globe

# APPENDIX III

## REFRACTIVE INDEX

AGM3III





## APPENDIX IV

# DEFINITION AND SYMBOLS OF RADAR CODED MESSAGE COMPONENTS

BASE	Base of an elevated layer.
CENTROID	The significant reflectivity values of a volume scan used to determine the locations of storm centers.
ENTER	The circulation of a hurricane or tropical storm is identifiable but no well-defined wall cloud is observed.
ECHO TOP	The Echo Tops algorithm estimates echo top heights for 2.2 x 2.2 nm grid boxes. A grid box represents the area on the earth where a single value of reflectivity is assigned.
EYE	A well-defined central region of a hurricane or tropical storm.
HAIL INDEX	<p>The hail index identifies one of four cases:</p> <ul style="list-style-type: none"> <li>• A given storm is producing or soon will produce hail.</li> <li>• A given storm is probably producing or will probably produce hail.</li> <li>• A given storm is not currently producing hail.</li> <li>• A given storm cannot be analyzed for hail due to lack of data.</li> </ul>
LEWP	Line echo eave pattern. A radar pattern formed when a segment of a line of thunderstorms surges forward at an accelerated rate.
MALF	Precipitation mostly aloft.
MESOCYCLONE	A 3-dimensional region in a storm that rotates cyclonically and is closely related to severe weather.
MLTLVL	Melting level.
PALF	Precipitation partially aloft.
TVS	Tornadic Vortex Signature. The radar "signature" of a vortex indicative of a tornadic circulation aloft that may or may not extend to the ground.

TYPE	SYMBOL	TYPE	SYMBOL
Rain	R	Drizzle	L
Rain Shower	RW	Freezing Drizzle	ZL
Freezing Rain	ZR	Ice Pellet	IP
Freezing Rain Shower	ZRW	Ice Pellet Shower	IPW
Snow	S	Hail	A
Snow Shower	S		



## APPENDIX V

# REFERENCES USED TO DEVELOP THE TRAMAN

**NOTE:** Although the following references were current when this TRAMAN was published, their continued currency cannot be assured. When consulting these references, keep in mind that they may have been revised to reflect new technology or revised methods, practices, or procedures. You therefore need to ensure that you are studying the latest references.

### Chapter 1

*Desk Reference for Receiver-Recorder Set, Meteorological Data AN/SMQ-11*, Reference Publication RP 52, Naval Oceanographic Office, Stennis Space Center, MS, 1993.

*GOES Products and Services Catalog*, U.S. Department of Commerce/ National Oceanic and Atmospheric Administration, Washington, D.C., 1996.

*GOES TAP Imaging System (GTIS)*, Hughes STX Corporation, 1992.

*GOES User's Guide*, U.S. Department of Commerce/National Oceanic and Atmospheric Administration, Washington, D.C., 1983.

*Interim Mobile Oceanography Support System (IMOSS) User's Guide (DRAFT)*, Naval Oceanographic Office, Stennis Space Center, MS, August 1997.

*Meteorology and Oceanography (METOC) Integrated Data Display System (MIDDS) User's Guide (Version 2.1)*, Naval Oceanographic Office, Stennis Space Center, MS, June 1998.

*Naval Tactical Applications Guide "Operational Environmental Satellites,"* NEPRF Technical Report TR 83-02, Naval Environmental Prediction Research Facility, Monterey, CA, 1983.

*Navy Oceanographic Data Distribution System (NODDS) Version 4.0 User's Manual*, Fleet Numerical Meteorology and Oceanography Center, Monterey, CA, 1996.

*NOAA KLM User's Guide (DRAFT)*, U. S. Department of Commerce/National Oceanic and Atmospheric Administration, Washington, D.C., August 1997.

*Operator's Manual, Tactical Environmental Support System (TESS (3.0)) and Shipboard Meteorological and Oceanographic Observing System (SMOOS), Vol. 11*, NAVELEXCEN VJO 14203-0302428A, NISE WEST Vallejo, CA, 1993.

*Organizational Maintenance with Illustrated Parts Breakdown Receiver/Recorder Set Meteorological Data AN/SMQ-11*, NAVAIR 50-30SMQ-11, Naval Air Warfare Center, Indianapolis, IN, 1990.

*Products Manual (Publication P-3140)*, Fleet Numerical Meteorology and Oceanography Center, Monterey, CA, October 1997.

*User's Logistics Support Summary (ULSS) for AN/SMQ-11B and AN/SMQ-11C Receiver-Recorder Set, Meteorological Data*, EM400-AR-LSS-010, Space and Naval Warfare Systems Command, San Diego, CA, May 1998.

*WEFAX User's Guide*, U. S. Department of Commerce/National Oceanic and Atmospheric Administration, Washington, DC., August 1994.

## Chapter 2

Federal Meteorological Handbook No. 11, FCM-H11A, *Doppler Radar Meteorological Observations (Part A)*, Washington, D.C., 1996.

Federal Meteorological Handbook No. 11, FCM-H11B, *Doppler Radar Meteorological Observations (Part B)*, Washington, D.C., 1990.

Federal Meteorological Handbook No. 11, FCM-H11C, *Doppler Radar Meteorological Observations (Part C)*, Washington, D.C., 1991.

Federal Meteorological Handbook No. 11, FCM-H11D, *Doppler Radar Meteorological Observations (Part D)*, Washington, D.C., 1992.

Frieden, David R., *Principles of Naval Weapons Systems*, Naval Institute Press, Annapolis, MD, 1985.

Operator's Handbook, *Principal User Processor, Volumes I, II, and III*, WSR-88D Operational Support Facility, Norman, OK, 1994.

Rinehart, Ronald E., *Radar for Meteorologists*, University of North Dakota, Grand Forks, ND, 1991.

Technical Document 1369, *Effective Use of the Electromagnetic Products of TESS and IREPS*, Naval Ocean Systems Center, San Diego, CA, 1988.

Technical Manual, *Operation Instructions, Principal User Processor (PUP) Group, Doppler Meteorological Radar WSR-88D*, NAV EM400-AF-OPI-010/WSR-88D, Secretary of the Navy, Washington, D.C., 1995.

Technical Manual, *System Description, Doppler Meteorological Radar WSR-88D*, NAV EM400-AA-MMM-010/WSR-88D, Secretary of the Navy, Washington, D.C., 1995.

# INDEX

## A

Absorption, 2-16  
Advanced TIROS-N satellite, 1-6  
Albedo, 1-11  
Alert messages, 2-34  
Alert-paired products, 2-34  
Algorithms, 2-27  
Aliasing, velocity, 2-19  
Amplitude, 2-4  
AN/SMQ-11 satellite receiver set, 1-27 to 1-28  
    ephemeris updates, 1-34  
Anomalous propagation, 2-12  
Antenna, wefax, 1-29 to 1-30  
Antenna-aiming diagram, geostationary satellite, 1-26  
Apogee, satellite orbit, 1-3  
APT service, 1-22  
Archive levels, 2-31  
Ascending node, 1-1  
Associated principal users, 2-30  
Attenuation, 2-15  
Automatic Digital Network (AUTODIN), 1-27  
Automatic Picture Transmission (APT), 1-22 to 1-25,  
    1-29  
Azimuthal resolution, 2-8, 2-9

## B

Backscattering, 2-15  
Base product, 2-34  
Base reflectivity product (REF), 2-34 to 2-35  
Base velocity product (VEL), 2-38  
Beam broadening, 2-8  
Beam width, 2-8  
Bounded weak echo region (BWER), 2-36 to 2-37  
Bright band, 2-37

Broadcast,

    fleet multichannel, 1-21  
    WEFAX 1-25

## C

C-element orbital data, 1-31, 1-34  
Composite reflectivity product (CR), 2-40, 2-41

## D

Decibel, 2-4  
Defense Meteorological Satellite Program, 1-5, 1-8  
Defense Switching Network (DSN), 1-21  
Derived product, 2-40  
Descending node, 1-1  
Diffraction, 2-14  
Direct-readout service, 1-22, 1-28  
DMSP satellite, 1-5, 1-8  
Doppler, 2-1, 2-16  
Doppler dilemma, 2-21  
Doppler radar, *see also WSR-88D*  
    principles, 2-16  
Doppler shift, 2-16  
Ducting, 2-14

## E

Earth-synchronous satellite, 1-1  
Echo tops products (ET), 2-43, 2-45  
Electromagnetic energy, 2-1  
Electromagnetic spectrum, 1-10, 2-2  
Electromagnetic terms, 1-10  
Electromagnetic waves, 2-21  
    properties of, 2-2 to 2-4  
Enhancement, satellite image, 1-14  
Enhancement curves, 1-14 to 1-20  
    pre-defined, 1-18  
    user-defined, 1-14

Ephemeris data, 1-32

Epoch, 1-1

Equator crossings orbital data, 1-31, 1-34

Equatorial satellite orbit, 1-1

External users, 2-30

## F

Fengyun satellite, 1-5

Fleet multichannel broadcast, 1-21

Fleet Numerical Meteorology and Oceanography  
Center (FNMOC), 1-21

FMH-11, 2-55

Freezing level, 2-37

Frequency, 2-4

Frequency band, 2-2

Full disk image, 1-13

## G

Geostationary satellite, 1-5

Geosynchronous, 1-1

Gigahertz (GHz), 2-2

GOES, 1-5

GOES legend, 1-18

GOES-TAP, 1-21

GOES-TAP Imaging Service (GTIS), 1-22

GOES temperature scale, 1-18 to 1-21

GOMS satellite, 1-8

Gradient, 2-13, 2-36

Gridding, satellite image, 1-31

Ground clutter, 2-15

## H

Hail index product (HI), 2-49, 2-52

Half-power points, 2-8

Hertz (Hz), 2-4

High-frequency (I-IF) broadcast, 1-21

High Resolution Picture Transmission (HRPT), 1-24 to  
1-25

Hook echo, 2-34

## I

IMOSS, 1-28

communications module, 1-29

ephemeris updates, 1-30 to 1-31, 1-34

main module, 1-29

satellite module, 1-28

Inclination angle, 1-2

Infrared image, 1-10 to 1-12

INSAT satellite, 1-8

Internet, 1-27

## L

Line echo wave pattern (LEWP), 2-36, 2-38

Listening time, 2-6

Longwave radiation, 1-10

Low-level wind shear (LLWS), 2-38

## M

M-units, 2-12

Maximum unambiguous range, 2-7

Megahertz (MHz), 2-2

Melting level, 2-37

Mesocyclone product (MESO), 2-46, 2-48

Meteor satellite, 1-8

Meteorology and Oceanography Intergrated Data  
Display System (MIDDS), 1-22

METEOSAT satellite, 1-8

Micrometer, 1-10

Minimum range, WSR--88D, 2-6

## N

N-units, 2-12

Nadir, 1-1

Narrowband, 2-31

NASA-2 line data, 1-34

National Weather Radar Network, 2-31

NAVSPASURCEN predict bulletins, 1-35

C-element, 1-34

equator crossings, 1-35

Navy Oceanographic Data Distribution System  
(NODDS), 1-21

Near-infrared, 1-12

Near-real time satellite image, 1-21

NESDIS, 1-5, 1-8

NEXRAD, *see* WSR-88D

NOAA, 1-3, 1-5

NOAA APT predict bulletins, 1-31

NASA-2 line, 1-32

TBUS, 1-31

NOAA satellites, *see* *polar-orbiting satellites*,

NOAASIS web site, 1-8

Nodal increment, 1-2

Nodal period, 1-1

Non-associated principal users, 2-30

Nyquist co-interval, 2-21

Nyquist interval, 2-20 to 2-21

Nyquist velocity, 2-20

## O

One-time request, 2-33

Orbits, satellite, 1-1

## P

Partial beam filling, 2-10

Perigee, satellite orbit, 1-3 to 1-4

Phase shift, 2-17 to 2-18, 2-21

Picture element, satellite image, 1-9

Pixel, satellite image, 1-9

POES, 1-7

Polarization, 2-2

Polar-orbiting satellites, 1-6 to 1-7

Power, 2-4

Principal user, 2-30

Principal user external sources (IVES), 2-30

Principal user processor (PUP), 2-27 to 2-31

Pulse length, 2-6

Pulse repetition frequency, 2-6

Pulse volume, 2-7

PUP, *see* *principle user processor*,

## R

Radiation, 1-10

Radiometer, 1-9

Radar,

characteristics, 2-6

configuration, 2-4

signatures, 2-34

Radar coded messages, 2-51

Radar data acquisition (RDA), 2-22

antenna, 2-24

ground clutter filtering, 2-27

pedestal, 2-24

radome, 2-24

range unfolding, 2-25

receiver, 2-25

signal processor, 2-25

special processes, 2-25

subcomponents, 2-23 to 2-27

transmitters, 2-25

Radar echoes, 2-2

Radar moments, 2-22

Radar product generator (RPG), 2-26, 2-27

Radar propagation, 2-5

anomalous, 2-12

factors affecting, 2-11

principles, 2-12 to 2-16

Radar pulse, 2-6

Radar resolution, 2-9

Radial, 2-18, 2-32

Radial velocity, 2-18

Radiation, 2-1

Radio frequencies, 2-2

Radio waves, 2-2

Range ambiguity, 2-7

- Range folding, 2-7
- Range resolution, 2-6, 2-10
- RDA, *see radar data acquisition*,
- Real-time satellite image, 1-24
- Reference orbit, 1-1
- Reflectivity, 2-4, 2-34
- Reflectivity cross-section (RCS), 2-51, 2-53
- Reflectivity gradients, 2-23, 2-34
- Refraction, 2-12
  - anomalous, 2-12
  - normal, 2-12
  - standard, 2-12 to 2-13
- Refractive index, 2-12
- Refractivity, 2-12
- Resolution,
  - azimuthal, 2-9
  - radar, 2-9
  - range, 2-10
  - satellite, 1-9
- Rmax, 2-7
- Routine product set, 2-33
- RPG, *see radar product generator*,

## S

- Satellites, 1-1
  - advanced TIROS-N, 1-5
  - DMSP, 1-8
  - geostationary, 1-1, 1-5
  - GOES, 1-5
  - foreign, 1-8
  - functions, 1-2 to 1-6
  - imagery from, 1-9
  - NOAA, 1-3
  - POES, 1-9
  - polar-orbiting, 1-1, 1-6
  - programs, 1-5
  - TIROS-N, 1-5

## Satellites-Continued

- terminology, 1-1
- types, 1-10
- Satellite ephemeris updates,
  - C-element, 1-34
  - ephemeris messages, 1-34 to 1-36
  - equator crossings, 1-35
  - for AW/SMQ-11, 1-34
  - for IMOSS SAT MOD, 1-30
  - for TESS, 1-34
  - NASA-2 line, 1-31
  - TEBUS, 1-31
- Satellite image acquisition, 1-21
  - AUTODIN, 1-27
  - automatic picture transmission (APT), 1-22 to 1-23
  - command and data acquisition (CDA) station, 1-25
  - direct-readout, 1-22
  - GOES-TAP, 1-21 to 1-22
  - GOES Tap Imagery Service (GTIS), 1-22
  - HF broadcast, 1-21
  - HRPT, 1-24 to 1-25
  - internet, 1-22
  - MIDDS, 1-22
  - NODDS, 1-21
  - WEFAX, 1-25
- Satellite image terms,
  - albedo, 1-11
  - enhancement, 1-14
  - enhancement curves, 1-14
  - full disk, 1-13
  - gridding, 1-31
  - infrared, 1-10
  - near-infrared, 1-12
  - near-real time, 1-21
  - picture element, 1-9
  - radiometer, 1-9

## Satellite image terms--Continued

- real-time, 1-24
- resolution, 1-9
- scan lines, 1-9
- SSMA, 1-8
- ungridded, 1-22
- visual (VIS), 1-10
- water-vapor (WV), 1-13

Satellite module (SAT MOD), *see* IMOSS,

## Satellite orbital data, 1-34

- C-element, 1-36
- equator crossings, 1-34 to 1-35
- NASA-2 line, 1-34
- TBUS, 1-31 to 1-33

## Satellite orbital terms, 1-1

- anomaly, 1-4
- apogee, 1-3
- ascending node, 1-3
- descending node, 1-3
- earth-synchronous orbit, 1-1
- epoch, 1-1
- equatorial orbit, 1-1
- geostationary orbit, 1-1
- geosynchronous, 1-1
- inclination angle, 1-1
- nadir, 1-1
- nodal increment, 1-1
- nodal period, 1-1
- perigee, 1-3
- polar orbit, 1-1
- subpoint, 1-1
- sun-synchronous orbit, 1-3

Scan lines, satellite image, 1-9

Scatterers, 2-3

Scattering, 2-15

Scatterometer, 1-8

Sensitivity, 2-5

Severe weather probability (SWP), 2-46, 2-47

Shortwave radiation, 1-10

Sidelobes, 2-9

Sine wave, 2-1

Solar activity, 2-16

Spatial resolution, 1-9

Spectrum width, 1-10

SSM/I, 1-8

Stationary satellite antenna-aiming diagram, 1-26

Storm track information (STI), 2-48, 2-50

Subpoint, satellite, 1-9

Subrefraction, 2-12

Sun-synchronous orbit, 1-3

Superrefraction, 2-13

## T

Tactical Environmental Support System (TESS),

- ephemeris updates, 1-34

TBUS bulletins, 1-30 to 1-33

- input for AN/SMQ-11, 1-34

- input for IMOSS, 1-30

- input for TESS, 1-31

TIROS-N satellite, 1-4, 1-6

Tornadic vortex signature (TVS), 2-46

## U

Ungridded satellite image, 1-23

Unit control position (UCP), 2-28 to 2-29

- applications terminal, 2-29

- system console terminal, 2-29

## V

VAD wind profile (VWP), 2-39, 2-43, 2-44

Velocity, 2-16, 2-23

Velocity aliasing, 2-19

Velocity cross-section (VCS), 2-51, 2-54

Vertically integrated liquid (VIL,), 2-40, 2-42

Visual imagery, 1-10 to 1-11

Volume coverage patterns, 2-32 to 2-33

## **W**

Water-vapor image, 1-13

Wavelength, 2-3, 2-17 to 2-18

Weak echo region (WER), 2-36 to 2-37

WEFAX service, 1-25

Wideband, 2-31

WSR-88D, 2-1

archiving, 2-31

components, 2-23 to 2-29

operational modes, 2-32 to 2-33

product acquisition, 2-33

products, 2-33

publications, 2-55

system communications, 2-30

system users, 2-29

WV satellite image, 1-13